

# Instruction Manual

## IEC<sup>®</sup> Centra CL2 Centrifuges

Cat. No.426: 120 VAC, 50/60Hz  
Cat. No.427: 240 VAC, 50/60Hz



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Analyze • Detect • Measure • Control™

**Thermo**  
ELECTRON CORPORATION



# Contents

1. Introduction .....	3
2. Installation .....	5
2.1 Receive the Unit .....	5
2.2 Prepare the installation site.....	5
2.3 Verify Power Configuration .....	5
2.4 Moving the Unit.....	5
3. Operation .....	6
3.1 Warnings and Cautions.....	6
3.2 Opening The Cover .....	6
3.3 Rotor Installation .....	6
3.4 Starting and Stopping a Run .....	6
3.5 Rotor Removal.....	6
3.6 Balance .....	7
4. Applications .....	8
4.1 Introduction .....	8
4.2 Speed and Force Tables .....	9
4.3 Derating Tables for Dense Samples .....	10
4.4 Chemical Resistance Table.....	11
4.5 Decontamination Table .....	12
4.6 RCF Nomograph.....	13
5. Maintenance .....	14
5.1 Care and Cleaning.....	14
5.2 Corrosion Cleaning Procedure .....	14
5.3 Storage: Keep the Unit Dry .....	14
5.4 Decontamination Procedures.....	14
5.5 Cover Interlock Bypass .....	14
5.6 Fuses .....	15
5.7 Brush Replacement .....	15
5.8 Calibration.....	15
5.9 Power Cord Inspection .....	15
5.10 Condition of Returned Equipment.....	15
5.11 Warranty.....	15
6. Specifications .....	16
7. Service .....	16
7.1 Warning Messages .....	16
7.2 Error Codes .....	16
7.3 Troubleshooting .....	16
7.4 Disassembly for Service .....	16
8. Drawings .....	18

# 1. Introduction

## 1.1 Product Description

The IEC Centra CL2 is a compact benchtop centrifuge designed for multipurpose use in medical, industrial, and scientific laboratories. There are two models:

- Cat. No. 426: 120 V, 50/60 Hz
- Cat. No. 427: 240 V, 50/60 Hz

The IEC Centra CL2 accommodates a wide variety of rotors including fixed angle and horizontal (swinging bucket). IEC AeroCarriers™ provide aerosol containment along with autoclaveability. The centrifuge can handle up to 300 ml (801 rotor), and reach maximum speeds of up to 8500 rpm (841 fixed angle rotor) and 3900 rpm (236 horizontal rotor).

The system also includes

- a cover interlock for safety and a 'glove-friendly' membrane control panel with digital speed and time displays
- an 'At Speed' timer mode allowing for accurate separations
- a continuous 'hold' mode

## 2. Installation

### 2.1 Receive the Unit

All units are shipped in protective packaging.

1. Follow the unpacking instructions on the carton.
2. Inspect the unit upon receipt and immediately file any damage claims with the shipper/carrier.
3. Complete and return the postage-paid warranty card.

### 2.2 Prepare the installation site

The unit normally resides on a bench top.

1. Place the centrifuge on a clean, dry surface, to make certain that the suction feet at the bottom grip the surface firmly. Keep the area beneath the unit free of debris and loose materials.

#### CAUTION

The resting surface must be level, to ensure quiet, vibration-free operation. A rigid and stable location is important. An improperly loaded centrifuge may vibrate or move

2. Locate the centrifuge to allow a clearance of 8 cm (3 inches) on each side and 4 in. (10.2 cm) in the rear of the unit for ventilation.

#### WARNING

International Electrotechnical Commission standard 1010 part 2-20 limits the permitted movement of a laboratory centrifuge to 12" (300 mm) in the unlikely event of a disruption. Laboratory management procedures should require that no person or any hazardous materials enter within this boundary while the centrifuge operates.

### 2.3 Verify Power Configuration

Verify that the correct power cord and connector is provided for your installation.

1. Using a voltmeter, measure the line voltage to ensure it is within the limits for your model. For Cat. No. 426 the line voltage should be between 108 and 132 VAC. For Cat. No. 427 the line voltage should be between 216 and 264 VAC. Variations in line voltage or frequency will affect the unit's speed and acceleration.
2. The unit requires a grounded power supply (3-outlet). If your facility does not have grounded power outlets, arrange for proper grounding.

#### WARNING



#### ELECTRICAL HAZARD!

Do not remove the grounding pin from the centrifuge power cord. Do not use the bare wired power cord to attach a power plug that does not have a grounding pin.

The power cord provided with the unit is correctly rated for the highest current demand. This power cord should not be interchanged with cords from equipment with lower current demand. Exchange of power cords between equipment may create a fire hazard.

### 2.4 Moving the Unit

To move the unit to a new location:

#### WARNING



The unit can weigh up to 222 lb. (101 kg). Use caution when moving to avoid any injury.

1. Check that the new site meets the criteria in Section 2.2 before moving the unit.
2. Before moving, unplug the centrifuge and remove all accessories and the rotor.
3. Position a flat object, such as a tongue depressor, near a suction cup at the bottom of the unit.
4. Lift up an edge of the cup, and insert the flat object far enough to break the vacuum suction seal.
5. When all four suction cups are disengaged, lift the unit from the work surface.
6. When the unit is in its new location, ensure that the suction cups adhere correctly to the work surface

## 3. Operation

### 3.1 Warnings and Cautions

#### ⚠ WARNING



To Avoid Electric Shock:  
Plug the power cord into a grounded outlet.

#### ⚠ WARNING



Never remove the grounding prong from the power plug, or use any adapter which does not complete the grounding circuit.

#### ⚠ WARNING



Always unplug the power cord before attempting to clean or service the centrifuge.

#### ⚠ CAUTION

DO NOT exceed maximum rated speed for each rotor/accessory combination. Maximum speeds can be found in Section 4.1 Speed and Force Tables. All rotors and accessories are stamped with their cat. no. for easy identification.

#### ⚠ CAUTION

Samples of specific gravity higher than 1.2 require the maximum speed to be derated.

#### ⚠ CAUTION

Ensure that loads are properly balanced around the rotor to minimize vibration. All Thermo Electron accessories are stamped with their weight for easy balancing.

#### ⚠ CAUTION

Do not block the vents, otherwise, airflow will be restricted.

#### ⚠ CAUTION

Be sure the rotor and accessories are properly installed before attempting to start a run.

### 3.2 Opening The Cover

Once the red light over the STOP button is steadily illuminated (no longer flashing) press the COVER OPEN button to release the interlock and allow the cover to be opened.

### 3.3 Rotor Installation

1. Check that the RED light over the STOP button is ON. This indicates that power is on, the rotor is stopped and the cover can be opened.
2. Push the COVER OPEN lever to the right and lift the cover.
3. Lower the rotor straight onto the shaft.
4. Screw the knurled metal locking nut (clockwise) onto the shaft to hold the rotor down (on some rotors, you must remove any sample tubes first.).
5. Tighten the nut with your fingers; do not use a tool.

NOTE: Rotors with or without a keyway can be used on the IEC Centra CL2 centrifuge as there is no key on the shaft.

### 3.4 Starting and Stopping a Run

To start a run:

1. Use the ARROW buttons to set the desired run time (0 to 30 minutes) in the TIME display, and the desired rpm in the SPEED display.
2. Press the START button.  
The green light under the START button will illuminate, and the time display will begin counting down. The actual speed is displayed in the SPEED display. The centrifuge will run for the set duration and decelerate to a stop.

NOTES:

- To terminate a run before time expires, press the STOP button. The red light over the STOP button illuminates when STOP is pressed or time expires, and it flashes until the rotor comes to a stop.
- The cover may be opened when the rotor speed is below 20 RPM.
- The time and speed settings cannot be changed during a run.
- A new run cannot be started until the rotor has come to a complete stop.
- For infinite spins (hold mode), use the arrow keys to scroll up past 30 minutes. The word 'HOLD' appears in the display. Pressing the START button will begin a run which can only be terminated by pressing the STOP button. In the hold mode, the timer counts up.
- To select the timing mode, use the arrow buttons to scroll down past 0 seconds. The letters 'Spd' or 'Acc' will appear. Press the arrow buttons to toggle between the two timing modes. 'Spd' is the 'At Speed' timing mode where the timer starts counting down when rotor reaches 95% of set speed. 'Acc' is the normal timing mode where the timer begins to count down as soon as the run button is pressed.

### 3.5 Rotor Removal

1. Remove any sample tubes, shields and other accessories from the rotor.
2. Unscrew (counterclockwise) approximately one full turn the knurled locking nut.
3. Place both your thumbs on the knurled locking nut and grip the rotor with your fingers. Push your thumbs down and at the same time pull the rotor up with your fingers. This should dislodge the rotor from the shaft. If unsuccessful, lightly tap the knurled metal locking nut with a rubber/plastic mallet or other similar object. The nut and the rotor can now be removed from the shaft.



### 3.6 Balance

A balanced load is essential for all centrifuges. An unbalanced load produces vibration, and can damage the unit. ALWAYS balance containers on opposite sides of the rotor.

**NOTE:** A 2-gram load imbalance, at a speed of 4600 RPM, imparts force equivalent to 20 pounds (9.1 kg) at rest. Always ensure that the rotor is loaded symmetrically, with a full complement of accessories, and a full (or paired) set of tubes. Tube adapters should also be installed symmetrically.

#### Balance load within 1 gram

The rotors are dynamically balanced at the factory. The manufacturer matches removable parts (trunnion rings, shields, buckets, and carriers) to within 1 gram, and stamps the weight on each piece. Check these markings, whenever you interchange parts, to ensure that opposite parts are matched. Ensure that the total weight of samples and removable parts, loaded in opposing positions, are equal in weight, to within 1 gram. The position numbers, present on many rotors and adapters, identify opposing tube positions.

Opposing containers must be alike in shape, thickness, and distribution of glass or plastic. This is especially important for large containers.

#### NOTE:

##### Swinging Bucket Rotors:

Tubes loaded into swinging bucket rotors must be symmetric, around the axis of rotation. Verify this by rotating the entire rotor 180° by hand. The loads should be in the same apparent positions (not mirror images). In addition, the loads within each bucket must, also, be symmetric around the bucket's pivot axis. Verify this by ensuring that each bucket is loaded so that it does not tilt from the vertical, when the rotor is at rest. Maintaining balance within each bucket ensures that the bucket and the tubes swing out to horizontal, when the rotor reaches operating speed, applying centrifugal force toward the bottom of the tubes. Failure to achieve full swing-out causes vibration and premature wear of the rotor and the motor.

Samples of like (similar) specific gravities may be processed in the same run, provided that the samples of the same type are balanced around the rotor, as though they were the only pairs in the rotor.

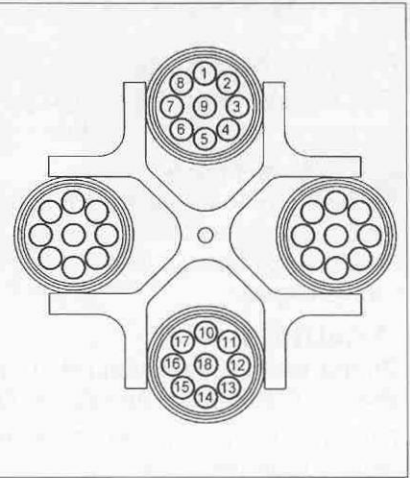
#### ⚠ CAUTION

Do not exceed maximum rated speed for each rotor/ accessory combination. Maximum rated speeds can be found in Section 4.2 - Speed And Force Tables.

#### Rotor Balance

Load tubes in the following manner:

1. Load four tubes at positions: 3, 6, 10, 13  
or 2, 5, 9, 12  
or 1, 4, 8, 11.
2. Load six tubes at positions:  
6, 7, 3, 13, 14, 10  
or 5, 7, 2, 12, 14, 9  
or 1, 7, 4, 8, 14, 11
3. Loading an odd number of tubes is not recommended.



#### Avoiding Vibration

All centrifuges have critical speeds at which vibration occurs. As the speed increases beyond the critical speed, vibration will cease. This inherent condition also occurs during deceleration. An imbalanced load intensifies these critical vibrations. You should avoid running the centrifuge at or near its "critical speed" to avoid excessive vibration.

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## 4. Applications

### 4.1 Introduction

This section describes the use of specific rotors and accessories. More detailed information is shipped with the rotor or accessory itself. This section contains five reference sections:

- Speed and Force Tables
- Derating Table for Dense Samples
- Chemical Resistance Table
- Decontamination Table
- Nomograph

#### CAUTION

**Do not exceed maximum rated speed for each rotor/accessory combination. Maximum rated speeds can be found in Section 4.2 - Speed And Force Tables.**

Relative Centrifugal Force (RCF or G-force) at a given speed varies with the rotor, and with the distance away (rotating radius) from the shaft of the centrifuge (center of rotation). The rotating radius is measured to the furthest inside tip of the tube, away from the centrifuge shaft. The Speed and Force Tables indicate the maximum speed and RCF that the centrifuge can achieve with various rotor/accessory combinations. The Derating Table specifies reductions in maximum RPM, when spinning samples with specific gravity above 1.2.

Use of any tube above its rated RCF can cause tube cracking. To avoid this, compare the G forces, specified in the Speed and Force Tables, with the ratings for the tubes that you are using. If the tubes are not rated for the force that the centrifuge will apply, look up their reduced g force rating and enter it on the control panel.

#### Corrosive Solvents

Your centrifuge is made of materials designed to resist immediate attack from most laboratory chemicals. Prolonged exposure should be avoided, by immediately removing the chemical from rotor or assembly. Rotors and accessories placed in the chamber are made of a variety of materials, including aluminum and polypropylene. The Chemical Resistance Table shows the suitability of each material with different classes of reagents.

Section 5.2 describes how to clean and remove corrosion from the chamber, rotors, and accessories. Follow these instructions and clean spills promptly to minimize the effect of corrosive chemicals and to avoid expensive repairs.

## 4.2 Speed and Force Tables

### Rotor 215 4-Place Swinging Bucket Rotor

Tube		Maximum RPM / RCF	Radius	Tr Ring	Shield or Carrier	Adapter	Cushion					
No. x Vol. (ml)	Description											
8x50ml	Falcon/Corning conical plastic	3100 1510	14.1	4x326	8x320	-	8x315					
	Corning 8300-50 conical glass					-	571					
8x15ml	Falcon/Corning conical plastic	3350 1750	13.9	4x325	4x320	8x1106	570					
4x50ml	Falcon/Corning conical plastic					-	4x315					
	Corning 8300-50 conical glass					-	571					
4x15ml	Falcon/Corning conical plastic					4x1106	570					
4x50ml sealed	Falcon/Corning conical plastic	3175 1750	15.4	4x350	4x323	-	315					
	Falcon/Corning conical plastic	3350 1750	13.9	4x325	4x320	4x1106	4x668					
4x15ml sealed	Falcon/Corning	3175 1710	15.2	4x350	4x7323	1106	4x571					
4x10-15ml sealed	Vacutainer 16x100-125mm					-	4x668					
4x7ml sealed	Vacutainer 13x100					4x1105	4x571					
12x10ml	16x100mm	3450 1725	12.9	4x366	4x1013	-	570					
12x7ml	16x75mm				4x1018		567					
16x7ml	13x100mm	3450 1700	12.8									
16x5ml	13x75mm											
20x5ml	12x75mm	4000 1975	11.1		4x369							
20x3ml	10x75mm											

### Rotor 221 6-Place Fixed Trunnion Swinging Bucket

Tube		Maximum RPM / RCF	Radius	Tr Ring	Shield or Carrier	Adapter	Cushion
No. x Vol. (ml)	Description						
6x15ml	Falcon/Corning	3100 1650	15.4	fixed	6x303	-	668
6x12.5ml	Kimble 45170-125				6x356		669
6x10ml	Corning 8080-10	3500 1890	13.8				

### Rotor 236 4-Place Aerocarrier Horizontal Swing-out Rotor

Tube		Maximum RPM / RCF	Radius	Tr Ring	Aero Carrier	Adapter	Cushion	
No. x Vol. (ml)	Description							
4x50ml	Falcon/Corning	3400 1950	15.0	fixed	4x2091S	-	-	
8x15ml		3400 2000	15.5		4x2092S			
8x10ml	Kova/Urisystem							
16x10ml	Vacutainer 16x100mm	3700 2200	14.3		4x2093S			
16x7ml	Vacutainer 13x100mm							
	Hemogard Vacutainer 13x100mm							
28x7ml	Vacutainer 16x75mm	3900 2150	12.7		4x2094S			
28x5ml	Vacutainer 13x75mm							
	Hemogard Vacutainer 13x75mm							

### Rotor 801 6-Place 45 degree Fixed Angle Rotor

Tube		Maximum RPM / RCF	Radius	Shield	Adapter	Cushion
No. x Vol. (ml)	Description					
6x50ml	Falcon/Corning conical plastic	3900 2050	12.1	6x305	-	6x315
	Corning 8300-50 conical glass				-	571
6x15ml	Falcon/Corning conical plastic	4500 2450	10.8	6x320	6x1106	570
6x50ml	Falcon/Corning conical plastic				-	6x315
	Corning 8300-50 conical glass				-	571
6x15ml	Falcon/Corning conical plastic				6x1106	570

### Rotor 804S 4-Place 40 degree Fixed Angle Rotor

Tube		Maximum RPM / RCF	Radius	Shield	Adapter	Cushion
No. x Vol. (ml)	Description					
4x50ml	Falcon/Corning conical plastic	4200 2270	11.5	323	-	315
	Corning 8300-50 conical glass				-	571
4x15ml	Falcon/Corning conical plastic	2500 1000	14.3	4x341	6x1106	570
4x60ml	Corning 8540-60				-	572

**Rotor 809 12-Place 45 degree Fixed Angle Rotor**

Tube		Maximum RPM / RCF	Radius	Shield	Adapter	Cushion
No. x Vol. (ml)	Description					
12x15ml	Falcon/Corning conical plastic	3800 2150	13.3	302	-	668
	Corning 8080-15 conical glass	3800 2050	12.7			570
126xDevice	Amicron Filtration Device	3900 2050	13.4	12x356		-
12x10ml	Corning 8080-10	4500 2310	10.2			570
12xDevice	Filtron or Millipore Devices	4500 2490	11.0			-
12x10ml	Corning 8080-10	4100 2270	12.1	12x303		12x668
	17x102mm	4100 2120	11.3			570

**Rotor 841 12-Place 45 degree Fixed Angle Rotor**

Tube		Maximum RPM / RCF	Radius	User Adapter
No. x Vol. (ml)	Description			
12x1.5-2.0ml	microtubes	8500 4680	5.8	-
12x0.7ml		8500 4770	5.9	5763
12x0.5ml		8500 3960	4.9	
12x0.4ml		8500 4680	5.8	5764
12x0.25ml		8500 3630	4.5	

**4.3 Derating Tables for Dense Samples**

The Speed and Force Tables list the maximum speed for each rotor/adaptor combination for the IEC Centra CL2 Series Centrifuges. These speeds are specified for samples whose specific gravity is not greater than

- 1.2 for swinging bucket rotors
- 1.5 for angle rotors

For denser samples, the maximum specified speed in RPM is reduced (derated) by a factor from the table below:

Derating Factor for:		
Specific Gravity	Swinging Bucket	Fixed Angle
1.2	1.000	1
1.3	.960	
1.4	.925	
1.5	.894	
1.6	.866	.967
1.7	.839	.939
1.8	.816	.912
1.9	.794	.888
2.0	.774	.866
2.1	.755	.844
2.2	.738	.825
2.3	.721	.807
2.4	.707	.790
2.5	.692	.774
2.6	.678	.758
2.7	.666	.744
2.8	.654	.731
2.9	.642	.719
3.0	.632	.707

Derating Example: A rotor rated for 4,000 RPM used with samples with a specific gravity of 1.4, cannot spin faster than 3,700 RPM. (4,000 x .925 = 3,700)

**Specific gravities greater than 3.0:**

This table is based on the formula:

$$\sqrt{(S_o/S_a)}$$

Use the same formula to compute derating factors for specific gravities greater than 3.0.

- $S_o$  is the maximum specific gravity allowed before derating (1.2).
- $S_a$  is the actual specific gravity of the sample.

**⚠ CAUTION**

Do not exceed the rated speed or specific gravity. Higher speeds or specific gravities will impose unnecessary wear on the centrifuge and can cause rotor failure. Wear and damage caused in this manner are not covered under warranty.



## 4.4 Chemical Resistance Table

The centrifuge, rotors and accessories are comprised of made of materials that are designed to resist attack from most laboratory chemicals. For your convenience, the chemical resistance table below shows the suitability of various materials with different classes of reagents.

**NOTE:** Refer to the cleaning section for information on cleaning and removing corrosion from various parts. Clean spills promptly to minimize the effect of corrosive chemicals and avoid expensive repairs.

	Plastic										Metal					Other			
	POLYALLOMER	POLYCARBONATE	POLYETHYLENE	POLYPROPYLENE	POLYURETHANE	PHENYLENE OXIDE (NORYL®)	MODIFIED (DELIRIN®)	ACETAL HOMOPOLYMER (CELCON®)	ACETAL COPOLYMER	NYLON	POLYSTYRENE	TITANIUM	STAINLESS STEEL	ALUMINUM	MAGANESE BRONZE	MAGNESIUM	RUBBER	BUNA-N	VITON®
Acids, dilute or weak	E	E	E	E	G	E	F	N	F	E	G	G	F	F	N	F	E	E	E
Acids*, strong or conc.	E	N	E	E	F	N	N	N	N	F	N	N	N	N	N	N	F	G	N
Alcohols, aliphatic	E	G	E	E	F	E	E	E	N	E	E	E	E	E	F	E	E	G	E
Aldehydes	G	F	G	G	G	G	G	G	F	N	E	E	E	E	E	E	E	N	E
Bases	E	N	E	E	N	G	N	G	F	E	E	E	E	E	E	E	G	G	N
Esters	G	N	G	G	N	E	G	G	E	N	E	E	E	E	E	E	N	N	E
Hydrocarbons, aliphatic	G	F	G	G	E	N	E	E	E	N	E	E	E	E	E	E	N	E	E
Hydrocarbons, aromatic	F	N	G	F	N	N	E	E	E	N	E	E	E	E	E	E	N	N	E
Hydrocarbons, halogenated	F	N	F	F	N	N	G	E	G	N	E	E	E	E	N	N	N	F	E
Ketones	G	N	G	G	N	N	E	E	E	N	E	G	G	G	E	N	N	N	E
Oxidizing Agents, strong	F	N	F	F	N	N	N	N	N	N	E	F	N	N	N	N	F	E	E
Salts	E	E	E	E	E	E	E	E	E	E	E	F	F	F	N	E	E	E	E

\*For Oxidizing Acids, see "Oxidizing Agents, strong".

Classification  
of Resistance

E = EXCELLENT

G = GOOD

F = FAIR

N = NOT RECOMMENDED

## 4.5 Decontamination Table

### Compatible Processes For Decontamination

Sterilization Methods	Plastic										Metal					Other				
	POLYALLUMER	POLYCARBONATE	POLYETHYLENE	POLYPROPYLENE	POLYURETHANE	MODIFIED PHENYLENE OXIDE (NORYL)	ACETAL HOMOPOLYMER (DELIRIN)	ACETAL COPOLYMER (CELCON)	NYLON	POLYSTYRENE	TITANIUM	STAINLESS STEEL	ALUMINIUM	MAGANESE BRONZE	MAGNESIUM	RUBBER	BUNA-N	VITON	PHENOLIC FIBER	PT - PAINTED SURFACE
<b>Mechanical</b>																				
Autoclave*	S	M	U	S	M	U	S	S	S	U	S	S	S	S	S	S	S	M	S	M
Ethylene Oxide Gas	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	U	S	S	S
Dry Heat (2Hrs. @ 160°C)	U	U	U	U	U	U	U	U	U	U	S	S	U	S	S	U	U	U	U	U
<b>Chemical</b>																				
Ethanol	S	S	S	S	U	S	S	S	U	M	S	S	S	S	S	S	S	S	S	S
40% Formalin	S	S	S	S	U	S	S	S	S	U	S	S	S	S	S	S	U	S	S	S
Methanol	S	M	S	S	M	S	S	S	U	M	S	S	S	S	S	S	S	U	S	S
2-Propanol	S	S	S	S	M	S	S	S	U	S	S	S	S	S	M	S	S	S	S	S
.5% Sodium Hypochlorite**	S	S	S	S	U	S	U	U	U	S	S	M	U	U	U	S	U	S	S	M
3% Hydrogen Peroxide	S	S	S	S	S	S	M	S	U	S	S	S	S	S	U	S	S	S	S	M
100% Hydrogen Peroxide	S	S	S	S	S	U	U	U	U	S	S	S	S	S	S	U	U	S	S	U
5% Phenol Solution	M	U	U	S	U	U	M	M	U	M	M	M	M	M	M	M	U	S	S	U

\*For Oxidizing Acids, see "Oxidizing Agents, strong"

Autoclaving 121° C for 20 min. @ 2 ATM (15 PSIG)

\*\* 1 to 10 Dilution of Household Bleach

S = SATISFACTORY

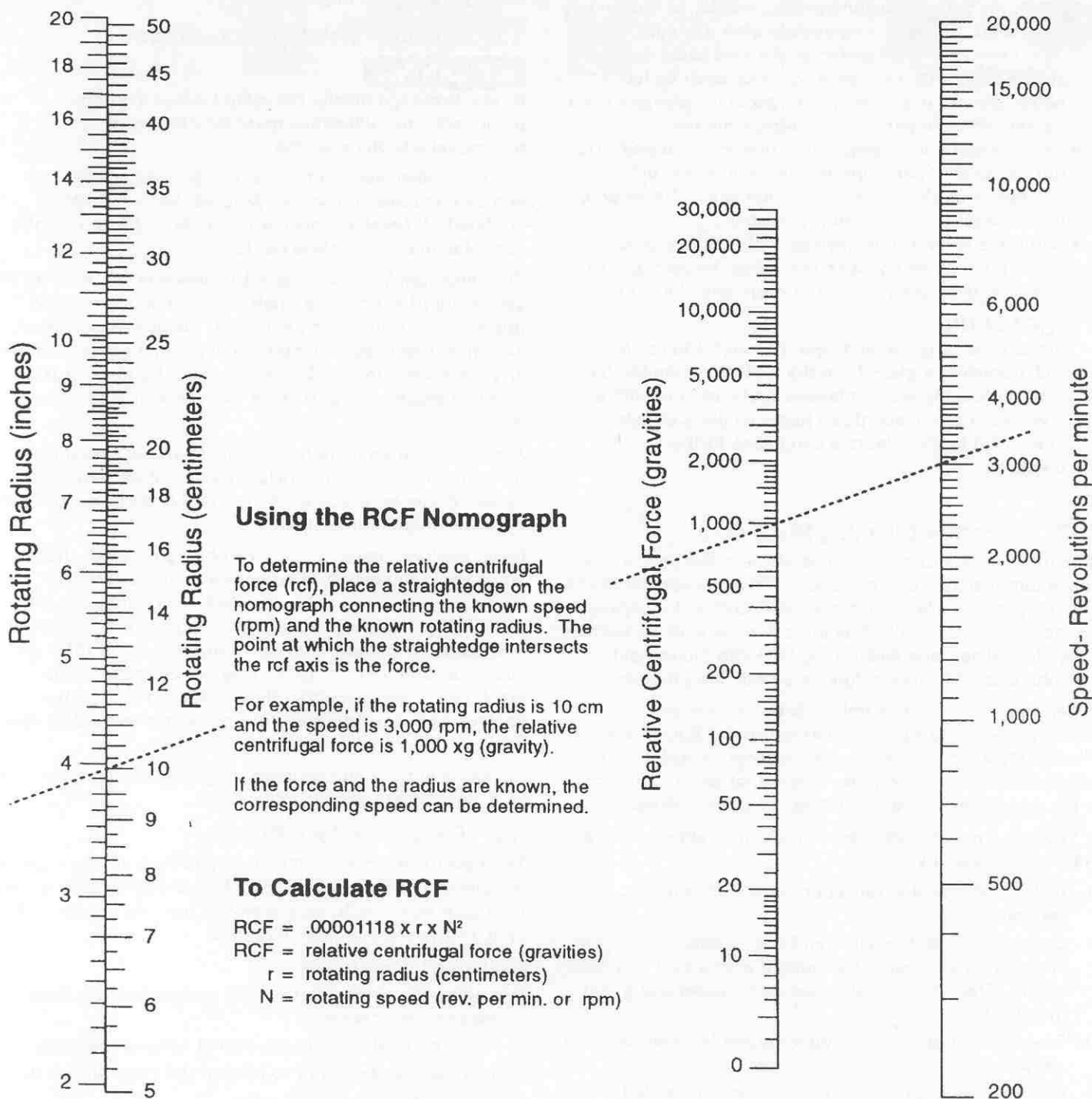
M - MARGINAL

U - UNSATISFACTORY

### WARNING

This chart describes the material compatibility of various sterilization methods. It does not specify the adequacy of sterilization. Refer to the Chemical Resistance Table on the previous page for material compatibility during centrifugation.

## 4.6 RCF Nomograph



## 5. Maintenance

### 5.1 Care and Cleaning

- Keep the centrifuge clean to ensure good operation and to extend its life.
- Clean the sample chamber, rotor, and lid, at the end of each work day, and immediately after any spill. Use a damp sponge, warm water, and a mild liquid detergent suitable for washing dishes by hand, such as Ivory® liquid. Do not use caustic detergents or detergents that contain chlorine ions. These attack metals.
- Remove stubborn stains with a plastic scrub pad. Do not use steel wool, wire brushes, abrasives, or sandpaper as they create corrosion sites. Never pour water directly into the rotor chamber.
- Scrub the rotor's tube cavities with a stiff test tube brush that has end bristles and a non-metallic tip. After cleaning, dry each part with a clean absorbent towel.

#### CAUTION

In the case of glass breakage, be careful to remove ALL particles of glass from the unit! In particular, be sure thoroughly scrub adapters and cushions with a wire brush or replace these items as glass shards embedded in the adapters can cause further breakage.

### 5.2 Corrosion Cleaning Procedure

The rotors and structural accessories are finished to give maximum resistance to corrosion. To maximize the life of the unit, continually inspect the rotor cavities for corrosion, especially if you use chloride ion solutions such as sodium chloride (saline), and sodium hypochlorite (household bleach), because these solutions attack most metals.

Clean the rotor, rotor chamber, and accessories (particularly the sample compartments and bucket cups) thoroughly after each exposure. Inspect all surfaces under bright light for corrosion. Be aware that small crevices grow deeper, eventually resulting in system failure.

If you see any corrosion, remove it immediately, using the following procedure:

1. Follow the cleaning procedure at the start of this section.
2. Soak the product in mild hand dish-washing detergent and scrub the product thoroughly with a stiff test tube brush. The brush should have end bristles and a non-metallic tip.
3. Soak the product in clear warm water for a minimum of an hour.
4. Rinse the product in warm water then in distilled water.
5. Dry the product thoroughly with a clean absorbent cloth.

#### CAUTION

If this procedure does not remove the corrosion, discontinue use of the product and inform technical service.

### 5.3 Storage: Keep the Unit Dry

Store parts on a soft surface to avoid damage.

Rotors and other parts should be clean and dry. Store them open to the air, not in a plastic bag, so any residual moisture evaporates. Face the parts upward to avoid moisture retention in the cavities.

### 5.4 Decontamination Procedures

#### WARNING

If tube breakage occurs releasing toxic, infectious, pathogenic, or radioactive material into the unit, decontaminate the chamber.

Rotors have sealed containers that provide aerosol containment and, if used as directed, keep spillage confined. If breakage occurs it may be sufficient to only decontaminate the sealed carriers.

The Decontamination Table in the previous section lists the sensitivity of various materials to common sterilization procedures. When using a 1-to-10 dilution of household bleach (sodium hypochlorite) to decontaminate metal rotors or accessories, follow decontamination by the corrosion cleaning procedure (5.2) since chloride ions attack most metals.

Always decontaminate for the minimum recommended time. If you observe corrosion, remove it as described earlier, discontinue use of the method and use an alternate decontamination procedure.

Polypropylene sealed carriers can be autoclaved. Remove any sample tubes before autoclaving unless they are completely full of sample. Remove caps, stoppers, and other tube closures before autoclaving to keep the tubes from collapsing under pressure. Autoclave the rotor and accessories at 121° C @ 15 psig for 20 minutes. Do not stack polypropylene rotors during this process. After cooling, perform a normal cleaning operation as described above.

Repeated autoclaving seriously degrades the performance of polycarbonate sealing covers.

### 5.5 Cover Interlock Bypass

The cover will remain locked if power fails. If you need to remove samples from the unit before power is restored, use the cover interlock bypass after the rotor has come to a stop. To bypass the cover interlock:

1. Unplug the centrifuge.
2. Locate the hidden plastic plug underneath the front ledge of the cabinet.
3. Use a screwdriver to pry out and remove the plug.
4. Pull the attached cord to release the cover interlock.
5. Replace the plug in the hole.

#### WARNING

Do not perform this operation routinely. The centrifuge's cover interlock provides operator safety. It allows the cover to be opened promptly, whenever rotation has stopped.



## 5.6 Fuses

Fuses are located internally within the centrifuge. They should only be replaced by qualified service personnel.

1. Remove all rotor and accessories from the chamber.
2. Gently tilt the unit onto its side and remove the four hex head screws which secure the baseplate.
3. Unscrew and remove the four rubber feet and lift the baseplate off.
4. The fuse(s) is mounted to the cabinet housing. Replace fuse(s) with:  
For 100/120 VAC 1 -4A, .25x1.25 in. part no. 40340  
For 220/240 VAC 2 - 2A, .25x1.25 in. part no. 40794

## 5.7 Brush Replacement

It is important to check the brushes periodically since damage to the motor can occur if the brush is allowed to wear down to the spring.

### **⚠ WARNING**

**DISCONNECT THE POWER CORD BEFORE REMOVING THE BRUSHES.**

1. Remove all rotor and accessories from the chamber.
2. Gently tilt the unit onto its side and remove the four screws which secure the baseplate. The brush caps are located on either side of the motor housing. Unscrew each cap with your fingers (or use a small flat screwdriver) and remove the brushes. There are two black caps which can be removed from the housing to allow use of a large screwdriver.
3. Measure the length of the brushes and replace both brushes if either one is less than 1/4 of an inch long.
4. Reinstall all parts removed.

### **⚠ CAUTION**

**WHEN REINSTALLING INSPECTED BRUSHES**

When brush replacement is not required it is important that a brush be inserted in the same position as it was removed. The trailing edge of the brush must be positioned properly. The trailing edge may be identified by the presence of a dark deposit of carbon along that side.

**NOTE:** New brushes may require a burn-in period of up to a half hour.

## 5.8 Calibration

The speed sensor used in the IEC Centra CL2 requires no calibration however you should verify its speed once every 24 months. This can be done by using an optical tachometer through the clear plastic viewport in the lid. Notify technical service if this measurement indicates instrument failure

## 5.9 Power Cord Inspection

Inspect the power cord every four months for signs of wear. Refer servicing to qualified personnel only. Replace power cord with Thermo Electron part number 44392 only.

## 5.10 Condition of Returned Equipment

Obtain a return goods authorization (RGA) before returning equipment to the manufacturer. The RGA paperwork includes a Certificate of Decontamination for you to sign. It indicates that you have performed the proper steps for decontaminating the unit.

### **⚠ WARNING**

**All returned units must be decontaminated, free of radioactivity, and free of hazardous, infectious, pathogenic, or toxic materials.**

All return equipment shipments will be refused until the signed certificate is received.

You must prepay transportation to the service depot.

## 5.11 Warranty

Warranty information is provided on the warranty card supplied with the centrifuge.

## 6. Specifications

Rotation Speed	8,500 RPM (Angle Rotor No. 841) 3,900 RPM (Horizontal Rotor No. 236)
Maximum RCF	4775 xg (Angle Rotor No. 841) 2200 xg (Horizontal Rotor No. 236)
Maximum Capacity:	400 mL (8x50 mL)
Sound Level	65 dB(A)
<b>Timer</b>	
Range Increments	0 to 30 minutes 0 to 1 minute by 5 seconds 1 to 5 minutes by 15 seconds 5 to 30 minutes by 1 minute HOLD mode up to 99 min., 99 sec.
Accuracy	± 1.0 %
<b>Speed</b>	
Range	1000 to 8500 rpm by 100 RPM
Accuracy	± 100 RPM
<b>Power</b>	
Power Requirement	120 VAC ± 10%, 60 Hz (Cat. No. 426) 240 VAC ± 10%, 60 Hz (Cat. No. 427)
Heater Output (typical)	175 watts (600 Btu/hr.)
<b>Dimensions</b>	
Height	Cover Closed: 11 in. (28 cm) Cover Opened: 24 in. (61 cm)
Width	13 in. (34 cm)
Depth	16 in. (40 cm)
Unit Weight	24 lb. (11 kg)
Shipping Weight	29 lb. (13 kg)

Specifications subject to change without notice.

## 7. Service

### 7.1 Warning Messages

A Warning Message indicates improper operation and may be cleared by opening the lid and correcting the problem.

Display	Meaning
Lid	The cover was not properly closed when the start button was pressed, or the cover was opened during a run.
PFL	Power to the centrifuge was lost during a run.

### 7.2 Error Codes

Error Codes indicate a malfunction of the centrifuge. They are cleared by disconnecting and reconnecting power to the centrifuge. If an Error Code or Warning Message persist, service may be required.

Display	Meaning
Er 1	Tachometer signal not present during a run.
Er 2	Speed is 500 RPM over set speed and not decelerating for more than 2 seconds, or speed is over 9000 RPM at any time.
Er 10	The motor voltage was detected to be over the maximum limit (94 volts).

### 7.3 Troubleshooting

#### Centrifuge won't start:

1. If the rotor stopped indicator (red LED) is lit, there is power to the centrifuge. If it is not lit, unplug the centrifuge and check the fuse(s).
2. Spin the rotor by hand to see that the "rotor stopped indicator" begins flashing, and listen for the latch to engage. This will verify the function of the tachometer and latch.

### 7.4 Disassembly for Service

#### ⚠ WARNING



##### SHOCK HAZARD.

The unit uses AC power, and some of the service procedures require operation with panels removed, exposing power lines. This introduces the risk of electric shocks. Service should be performed by qualified personnel only. Do not touch exposed wires without first unplugging the unit.

#### ⚠ CAUTION



##### STATIC ELECTRICITY DAMAGE.

The circuit boards contain electronics that can be damaged by static electricity. Persons doing extensive maintenance on the circuit boards, or removing individual components from the circuit boards, should be grounded (such as by wearing a wrist strap.) When shipping a circuit board, always enclose it in a static-protective bag.

1. Unplug the centrifuge from its power source.
2. Remove the rotor and accessories from the chamber.
3. Gently tilt the unit onto its side and remove the four hex head screws which secure the baseplate.
4. Unscrew and remove the four rubber feet and lift the baseplate off.
5. With the cover open, remove the four screws (two on each side) from the control tower. Gently pull the tower outward without removing it completely (there are wires connecting it to the chamber).
6. To remove the guard bowl, locate and remove the 9 screws at the base of the centrifuge chamber. To remove the cover from the guard bowl, pry off one end cap from the hinge pin. Slide the pin out.

#### Interlock

The centrifuge has a safety interlock which prevents the cover from being opened unless the rotor is turning 20 RPM or less. There is a switch in the interlock assembly which senses that the cover is closed and locked. It is a normally open switch and closes when the solenoid is in the locked position. When pressed, the STOP/COVER OPEN button releases the safety interlock by powering the solenoid through the Interlock PC board.

- The solenoid coil has a resistance of approximately 80 Ω. Power to the solenoid should be approximately 170 VDC. Voltage is provided by the Interlock PCB when the STOP/COVER OPEN button is pressed.

- To measure the voltage, disconnect the solenoid at JP4 and read across the BRN and YEL leads. Verify the function of the switch using an ohmmeter.
- To replace the interlock, remove the four screws which secure the latch assembly to the cabinet. Snip the wire ties in order to disconnect all leads to the latch assembly. Make note of wiring before disconnecting. Reconnect wires as noted, or using the diagram provided at the end of this manual.

The slots in the latch assembly mounting bracket are for proper positioning. Raise or lower the height of the assembly so that when the cover is closed completely switch SW1 (WHT and WHT/BLK leads) is engaged by the roll pin of the solenoid plunger. A run may not be started until the switch is engaged.

### Timer PCB

The IEC Centra CL2 has a Timer/Display PCB mounted behind the membrane control panel. The timer PCB contains the EPROM and delivers power to the motor. To replace it, the tower must first be removed (see See 7.4 "Disassembly for Service" on page 16). The PCB is secured to the tower by four screws

### **⚠ CAUTION** STATIC DAMAGE.

To prevent damage to the PC board, always use a static protective device (such as wriststrap) when handling or servicing.

### Motor

The IEC Centra CL2 uses an AC series wound drive motor. The motor is not a singular replaceable component, as the base housing of the centrifuge serves as the motor housing. The motor is comprised of an armature (includes bearings), field, brushes, brush holders, brush caps, brush leads, and a magnetic rotor. All of these parts are available separately (as well as motor bearings) for repair purposes.

- When isolated, the armature resistance should be approximately 6.3  $\Omega$ . This can be measured by disconnecting the RED and WHT motor leads and measuring the resistance across them. When isolated, the field resistance should be approximately 10  $\Omega$ . It can be measured by disconnecting the Red and BLK motor leads (BLK at BR1).
- To access the motor, remove the baseplate (See 7.4 "Disassembly for Service" on page 16) and then the top cap located in the guard bowl. Two Phillips head screws secure the top cap. When removing the top cap, take care not to lose the pre-load washer which rests on top of the upper bearing.
- To replace the armature, the brushes must be removed (See 5.7 "Brush Replacement" on page 15), and the magnetic rotor taken off of the motor shaft. Magnetic rotor removal requires that the Interlock PCB be removed (see instructions above). It is secured with Loctite® 454. Use care not to break the magnetic rotor. Once brushes and the magnetic rotor have been removed, the armature simply lifts out of the housing. The field rests inside the housing. To remove it, simply disconnect the three motor leads (RED, WHT, BLK) and lift it out.

Located below the field are the two set screws which secure the brush holders in place. To replace or adjust a

brush holder, loosen the set screw. This allows the brush holder to be moved or removed. The set screw may be accessed through the two holes in the field through which the top cap mounting screws secure the top cap to the base.

The Interlock PCB in the IEC Centra CL2 disables power to the interlock during rotation. This PC board is mounted below the motor. To sense rotation, it uses a Hall effect sensor to pickup pulses from a magnetic disk mounted on the motor shaft.

### **⚠ CAUTION** STATIC DAMAGE.

To prevent damage to the PC board, always use a static protective device (such as wriststrap) when handling or servicing.

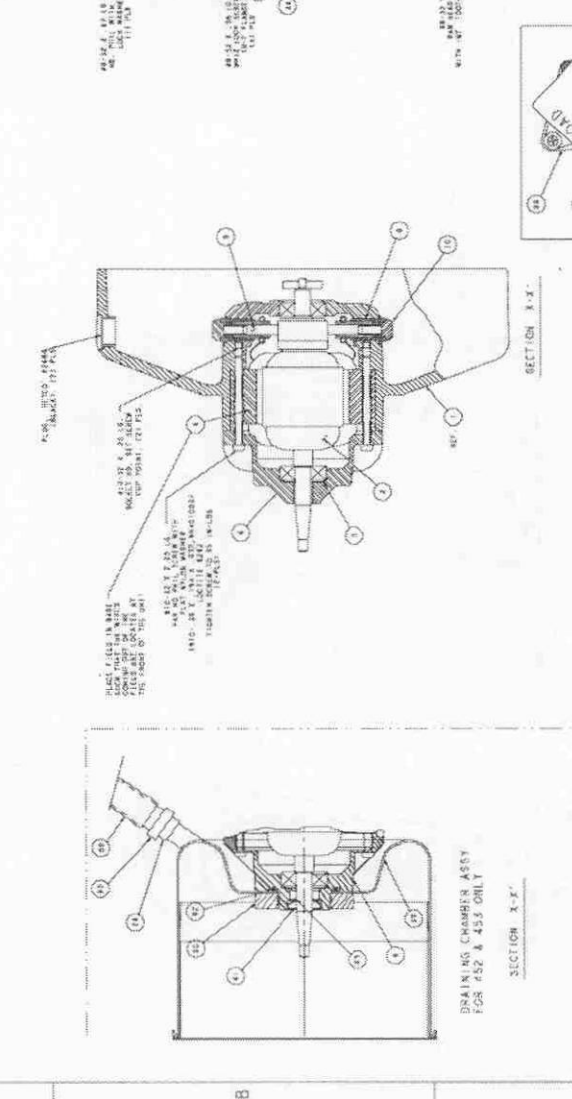
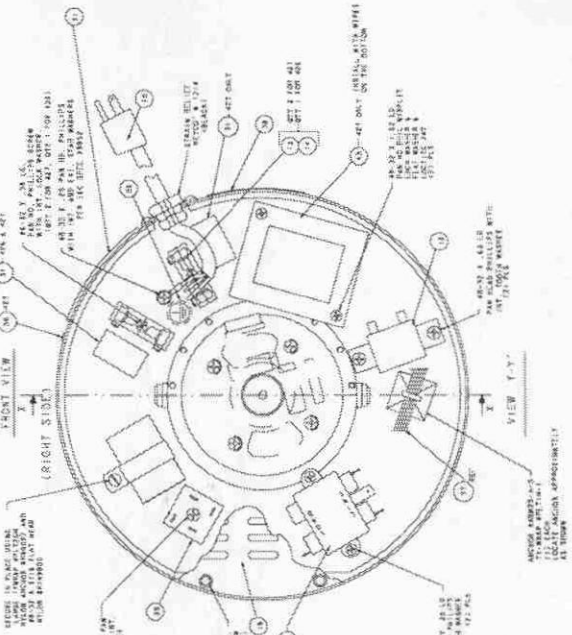
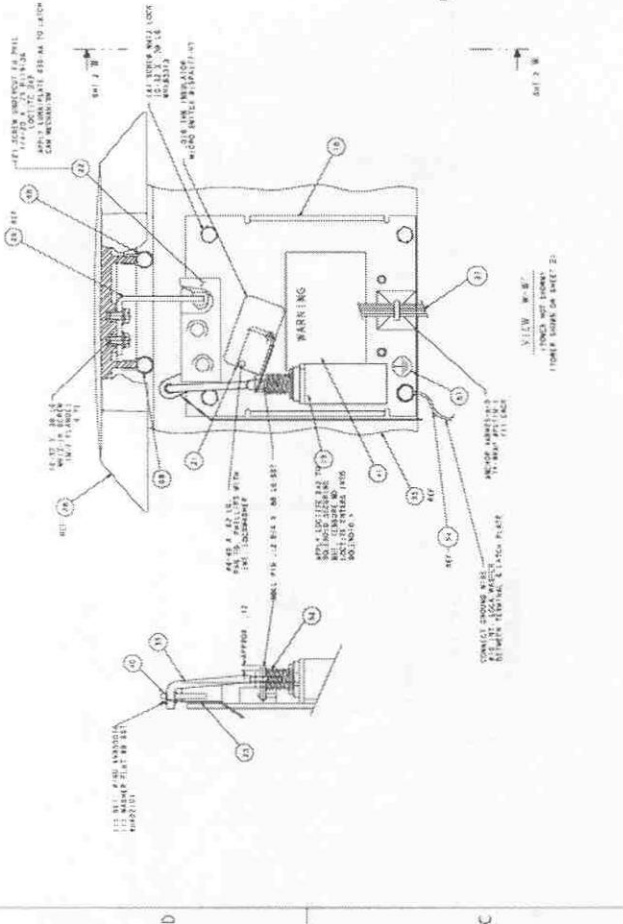
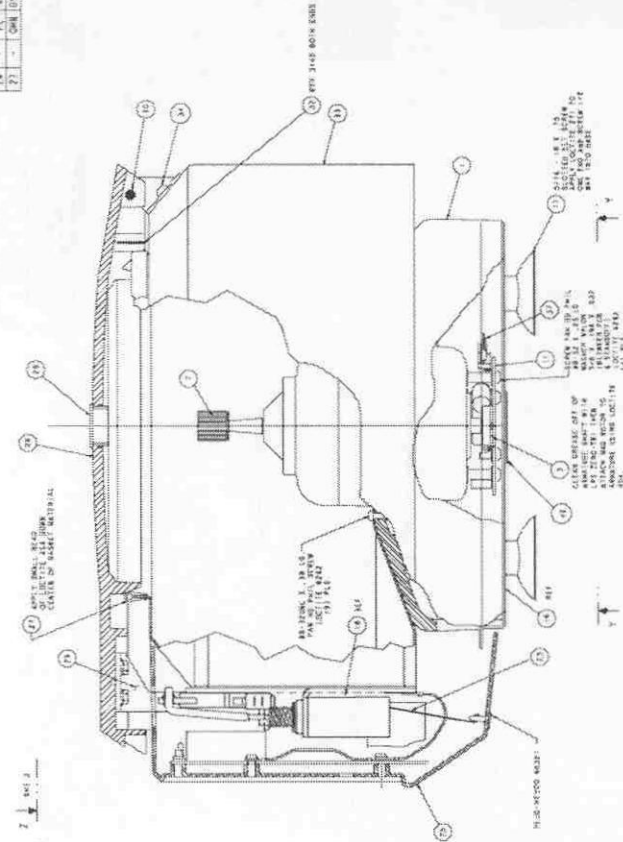
To replace the PCB, disconnect the wiring harness and remove the four mounting screws which secure the PCB to the base housing. Take care not to damage the speed sensor when lifting the PCB off of the housing.

## 8. Drawings

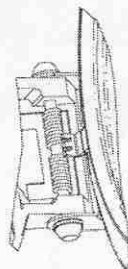
Drawing No.	Description
426	CL2 Assembly and Parts List
10944	Wiring Diagram
10895	Timer/Display PCB Schematic
44416	Timer/Display PCB Layout
PL-44416	Timer/Display PCB Parts List
10875	Interlock PCB Schematic
44566	Interlock PCB Layout
44566 Parts list	Interlock PCB Parts List



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CHECKED BY: WJ		DESIGNED BY: WJ	
APPROVED BY: WJ		DATE: 11/17/70	
SCALE: 1/2" = 1"		SHEET NO: 426A	
SHEET OF 3		SHEET OF 3	

[illegible]

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OF THE ABOVE SECTION, AND MAY NOT  
BE INCONSISTENT WITH THE CONCEPT

TABLE 2. *Phylogenetic relationships of the 10 species of the genus* *Phrynosoma* *based on the analysis of the 16S rDNA sequence*

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36		

[illegible]

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		6116	WATER-120V	1000000
		6117	WATER-120V	1000000
		6118	WATER-120V	1000000
		6119	WATER-120V	1000000
		6120	WATER-120V	1000000
		6121	WATER-120V	1000000
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4558-512		FORMA 400 ML. CATALOG NUMBER	
22027-640V		5538	
QTY	UNIT	DESCRIPTION	UNIT PRICE
1	EA	1ST WAGON	
1	EA	2ND WAGON	
1	EA	3RD WAGON	
1	EA	4TH WAGON	
1	EA	5TH WAGON	
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1	EA	100TH WAGON	

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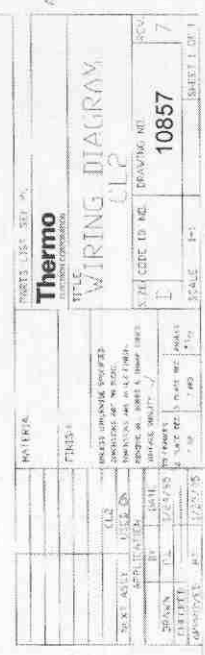
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ASSY C/L	BIOMET VERSION	CATALOG NUMBER
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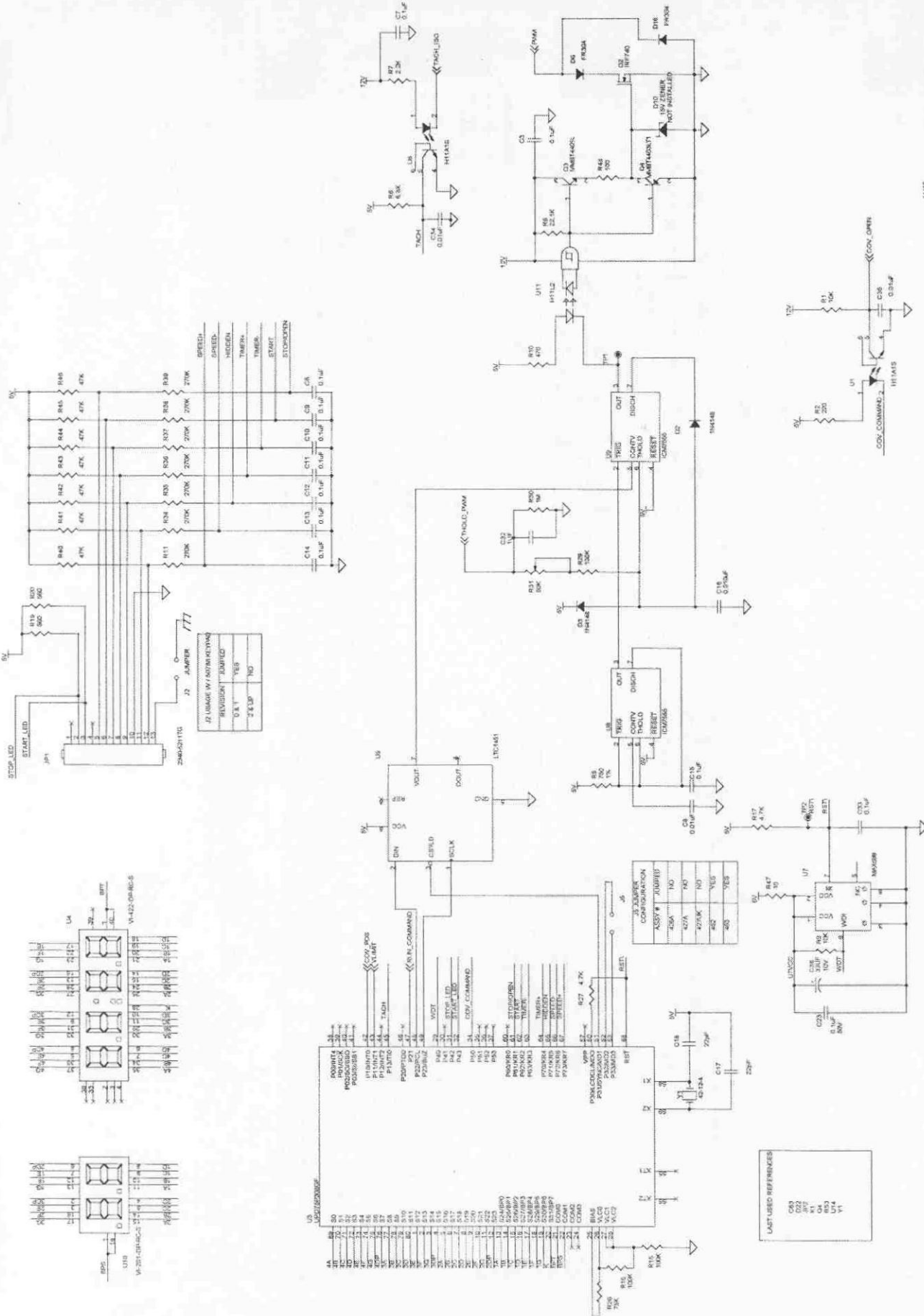


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J4 USE/NO W / INTERLOCK BODY	
ASSEMBLY	INSTALLED
44870	NO
44418	YES

44748	<b>Thermo</b> 617-274-5517/2778	U.S. Digital Temperature/Moisture Datalogger	10895
			10895
			10895





USED ON : CL2  
DATE PRINTED : 01/11/99

TITLE  
ASSY, PC BD

IEC PARTS LIST  
44416 REV 0

1	1	44417	PC BD, MACHINED					
2	1	50498	MICROCONTROLLER, PROGRAMMED	U3	NEC	UPD75P308GF	SM	
3	3		IC,OPTOCOUPLER,TRANS OUT	U1, U6, U13	ISOCOM	H11A1	TH	
4	1		LCD DISPLAY,4 DIGIT	U4	VL ELECT.	VI-422-DP-RC-S	TH	
5	1		IC,SUPPLY MONITOR W/WATCHDOG	U7	LIN TECH or	LT699CS8 or	SM	
					MAXIM	MAX699CPA		
6	2		IC,TIMER,CMOS,SURFACE MOUNT	U8,U9	PHILIPS	ICM7555CD	SM	
7	1		LCD DISPLAY,2 DIGIT	U10	VL ELECT.	VI-201-DP-RC-S	TH	
8	1		IC,OPTOCOUPLER,LOGIC OUT	U11	QUAL TECH	H11L2	TH	
9	1		IC,DUAL COMPARATOR,SMT	U12	SAMSUNG	KA2903D-TF	SM	
10	3	COM'L	DIODE,SIGNAL	D1,D2,D3	ROHM	1N4148	TH	
11	2	COM'L	DIODE,1A,200V	D7, D15	GI	1N4002	TH	
12	1	COM'L	DIODE,ZENER, 43V	D4	MOTOROLA	1N5262C	TH	
13	3	COM'L	DIODE,FAST RECOVERY	D5,D6, D16	DIODES	FR304	TH	
14								
15	3	COM'L	CAP, ELECT, 1000uF, 25V	C52, C55, C56	PANASONIC	ECE-A1EGE-102	TH	
16	3	COM'L	CAP,FILM,,1UF,250V	C1,C27, C62	PANASONIC	ECQ-E2104KF	TH	
17	2	COM'L	CAP,ELECT,2200uF,10V	C2, C54	PANASONIC	ECE-A1AGE-222	TH	
18	1	COM'L	CAP,FILM,1UF,250V	C32	PANASONIC	ECQ-E2105KF	TH	
19	19	COM'L	CAP,MONO-CER,0.1UF	C3,C6,C7	KEM	C1206C104K5RAC	SM	
				C9-14				
				C19-C21,C23,				
				C25,C30,C33				
				C60,C61, C63				
20	2	COM'L	CAP,CER. 0805 CHIP,0.01uF	C8, C34	KEM	CO805C103K5RAC	SM	
21	1	COM'L	CAP,MTL FILM,0.1uF,5%	C15	PANASONIC	ECQ-V1H104JL	TH	
22	1	COM'L	CAP,MONO, 0.010uF, 5%	C16	NIC	NMC1812NPO103J50	SM	
23	2	COM'L	CAP,MONO CER,22pF	C17,C18	KEM	C1206C220K5GAC	SM	
24	2	COM'L	CAP,'Y' TYPE,1500pF	C22, C4	PAN	ECK-DRS152ME	TH	
25	4	COM'L	CAP,MONO-CER,1UF	C24,C26,C29,	NIC	18122SU105M50TR	SM	
				C31				
26	1	COM'L	CAP,'Y' TYPE,3300pF	C28	PAN	ECK-DRS332ME	TH	
27	7	COM'L	RES, 270K,1/8W,5%,1206	R11, R34-R39	DALE	CRCW1206274J	SM	
28	8	COM'L	RES, 47K,1/8w,5%,1206	R14,R40-R46	AVX	CRCW1206473J	SM	
29	1		RES,WIREWOUND, 10K, 5W, 5%	R3	DALE	CW, 10K OHMS	TH	
					CLAROSTAT	SC5E- 10K	TH	
30	1	COM'L	RES,100,1/4W,5%	R48			TH	
31	1	COM'L	RES,750,1/8W,1%	R5	DALE	CRCW12067500F	SM	
32	1	COM'L	RES,6.8K,1/8W,5%	R6	DALE	CRCW1206682J	SM	
33	1	COM'L	RES,2.2K,1/8W,5%	R7	DALE	CRCW1206222J	SM	
34	1	COM'L	RES,22.1K,1/8W,1%	R8	DALE	CRCW12062212F	SM	
35	5	COM'L	RES,10K,1/8W,1%	R9,R18,R23,R22	DALE	CRCW12061002F	SM	
				R1				
36	1	COM'L	RES,470,1/8W,5%,CF	R10	AVX	CRCW1206471J	SM	

USED ON : CL2  
DATE PRINTED : 01/11/99

TITLE  
ASSY, PC BD

IEC PARTS LIST  
44416 REV 0

37	1	COM'L	RES,57.6K,1/8W,1%	R28	DALE	CRCW12065762F	SM
38	1	COM'L	RES,470K,1/8W,5%	R13	DALE	CRCW12064703J	SM
39	1	COM'L	RES, 220OHMS,1/8W, 5%	R2	DALE	CRCW1206221J	SM
40	2	COM'L	RES,100K,1/8W,5%	R15,R16	DALE	CRCW1206104J	SM
41	3	COM'L	RES,4.7K,1/8W,5%	R17,R24,R27	DALE	CRCW1206472J	SM
42	1	COM'L	RES,2.87K,1/8W,1%	R21	DALE	CRCW12062871F	SM
43	2	COM'L	RES,560,1/8W,5%	R19,R20	DALE	CRCW1206561J	SM
44	1	COM'L	RES,562K,1/8W,1%	R25	DALE	CRCW12065623F	SM
45	1	COM'L	RES,75K,1/8W,5%	R26	DALE	CRCW1206753J	SM
46	1	COM'L	HEADER,13 PIN	JP1	3M	2340-5211TG	TH
47	1	COM'L	HEADER,11 PIN,LOCKING	JP2	MOLEX	22-23-2111	TH
48	1	COM'L	RES, 200K,1/8W,1%, 1206	R12	DALE	CRCW12062003F	SM
49	1	COM'L	RES,130K,1/4W,1%	R29	DALE	CRCW12101303F	SM
50	1	COM'L	RES,1M,1/8W,5%	R30	DALE	CRCW1206105J	SM
51	1	COM'L	RES,POT,10 TURN,50K	R31	BOURNS	3266X-1-503	TH
52	4	COM'L	WIRE,JUMPER,SOLID,24 AWG	J1-J4,F1,F2,F4			TH
53	1	COM'L	RES,1K,1/8W,5%,1206	R53	DALE	CRCW1206102J	SM
54	1		TRANSISTOR, NPN	Q3	MOTOROLA	MMBT4401L	SM
55	1		TRANSISTOR, PNP	Q4	MOTOROLA	MMBT4403L	SM
56	1		MOSFET,N CHANNEL	Q1	SUPERTEX	VN2110K1	SM
57	1		MOSFET,N CHANNEL	Q2	DIODES	IRF740	TH
58	1	COM'L	BUSHING, NYLON	Q2/1	BERGQUIST	22MS1008	N/A
59	1	COM'L	SIL PAD	Q2/2	BERGQUIST	200-30MAC-54	N/A
60	1	COM'L	REGULATOR, 5V, 1A	VR1	NATIONAL	LM340T-5.0	TH
61	1	COM'L	REGULATOR, 12V, 1A	VR2	NATIONAL	LM340T-12.0	TH
62	1	COM'L	HEAT SINK,CLIP-ON,TO-220	VR1/1	AAVID	576802-B03100	TH

Item 63: When using Maxim chip items 73,74 and 78 must be used. Do not install items 73,74,and 78 when using the Linear Tec Chip.

63	1		IC,D-to-A CONVERT W/V OUTPUT	U5	LINEAR TEC or MAXIM	LTC1451CS8 or MAX515CSA	SM
64	1	COM'L	DIODE, ZENER, 51V	D8	MOT	1N5260C	TH
65	2	COM'L	DIODE ZENER, 1/4W, 5%,	D9, D10	MOTOROLA	1N4678	TH
66	1	COM'L	DIODE BRIDGE, 1A, 400V	BR1,2	DIODES INC	DF04S	SM SMBR4
67							
68	1		TRANSFORMER 14VAC/7VAC CT,5VA	T1	TELEMA	70020K	TH
69	1	COM'L	OPTO-ISOL, AC, SW NPN	U14	MOTOROLA	H11AA1	TH
70	REF	10895	SCHEMATIC, DIGITAL TIMER, REV 0				
71	REF	44417	ARTWORK,PC BD,DIGITAL TIMER/PWM				
72	REF	35616	TEST FIXTURE& PROCEDURE,PC BD				
73	1	COM'L	RES, 3.16K, 1/8W,1%, 1206	R32	DALE	CRCW12063161F	SM
74	1	COM'L	RES, 2.37K, 1/8W,1%, 1206	R33	DALE	CRCW12062371F	SM
75	1	COM'L	RES, 10 OHM, 1/4W, 5%	R47	DALE		TH
76	2	COM'L	RES, 100OHM, 1/4W, 5%,1206	R51,R52	DALE	CRCW1206101J	SM
77							
78	1	COM'L	CAP, 1206 CHIP 0.01uf	C5	PANASONIC	ECU-V1H103KBM	SM
79	1	COM'L	CAP,Tantalum,33UF,10V,20%	C36	AVX	CWR09FC336M	SM
80	1	COM'L	CAP,MONO-CER,0.01uF, 50V	C35	PANASONIC	ECU-S1J103JCB	TH



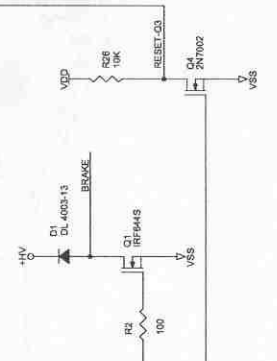
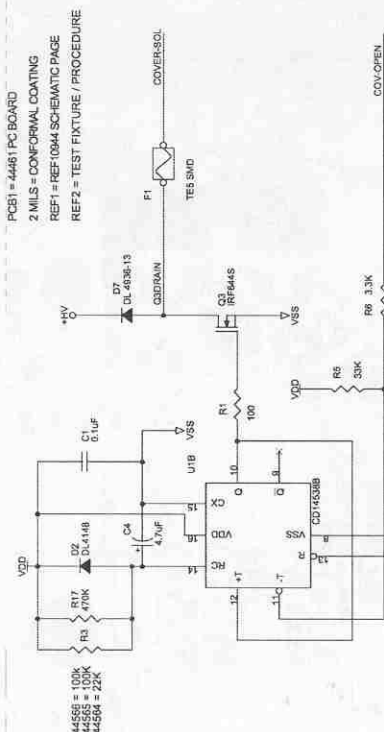
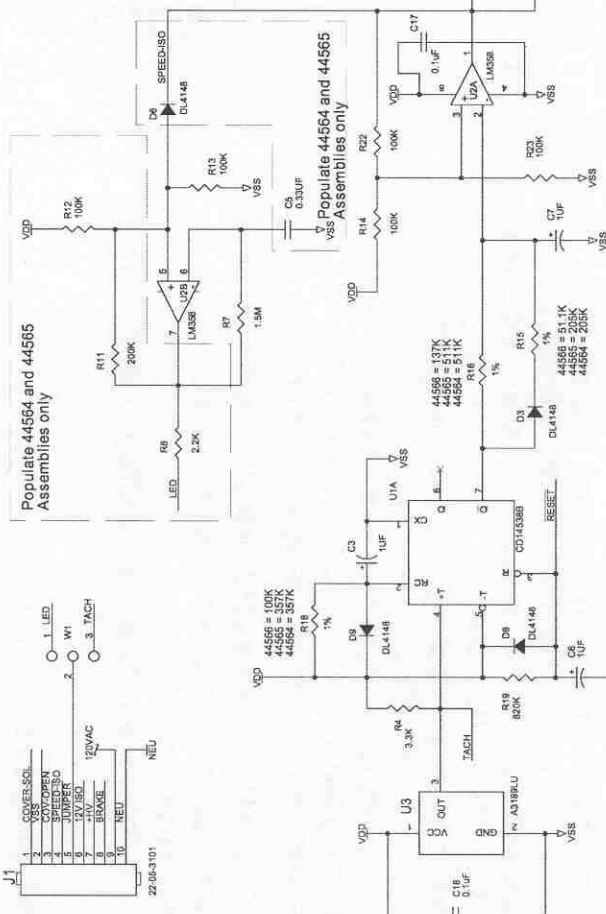
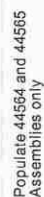
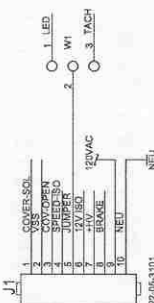
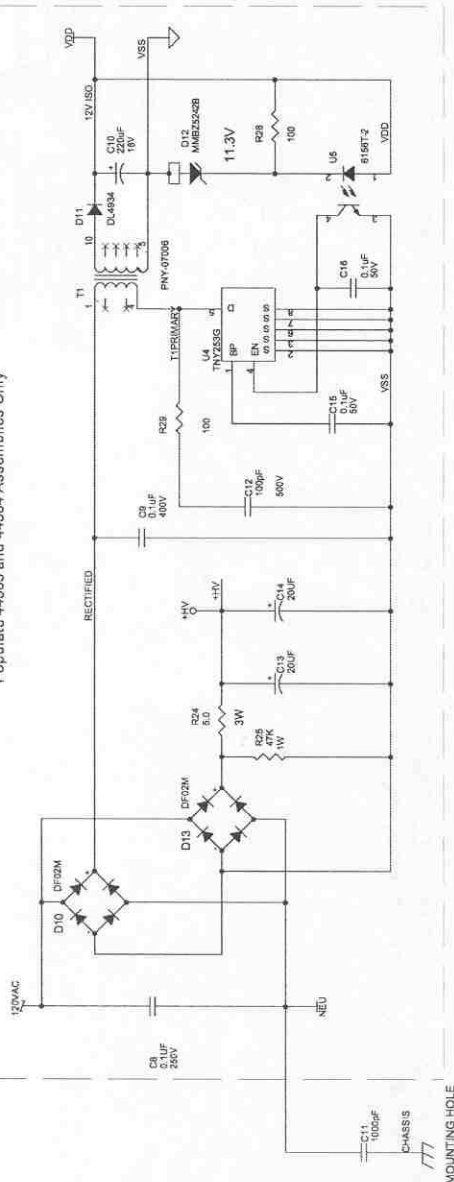
USED ON : CL2  
DATE PRINTED : 01/11/99

TITLE  
ASSY, PC BD

IEC PARTS LIST  
44416 REV 0

81	1	COM'L	CAP, ELECTROLYTIC, 470UF, 50V	C53	PANASONIC	ECE-A1HGE-471	TH
82							
83	1	COM'L	CRYSTAL, 4.194304 MHz	Y1	ECS, Inc.	42-12-4	TH
84	1		RELAY, DPDT	K1	POTTER/BRUMF	RKA-11DZ-05	TH
85	1		HEAT SINK, 1.0 IN, VERTICAL MNT	Q2/6	THERMALLOY	6296B	TH
86							
87							
88							
89	1		FUSE, 80mA, 125V, SLO BLO, TE5	F3	WICKMAN	19396-026-K	TH
90	1		FUSE HOLDER, TE5	F3/1	WICKMAN	19562	TH
91	2	COM'L	VARISTOR SUPPRESSOR, 150V	D13, D22	EDAL	150LA5	TH
92	2	COM'L	SOCKET, STRAIGHT	U4/1	MILLMAX	310-93-120-41-001	TH
93	2	COM'L	SOCKET, STRAIGHT	U10/1	MILLMAX	310-93-109-41-001	TH
94							
95	1	COM'L	SCREWS, SS, PAN HD, PHIL, #4-40, 0.38L	Q2/3	GENERIC		
96	1	COM'L	NUT, SS, #4-40	Q2/4	GENERIC		
97	1	COM'L	WASHER, SS, SPLIT LOCK, #4	Q2/5	GENERIC		
98	6	COM'L	TEST POINTS	TP1 - TP6	MILLMAX	2108-2-00-44-00-00-07-0	TH

ASSY KEY		REVIEWS				
Model	ASSY	REV	BY	ECO	APPD	DATE
Q.2	44598	0	JZ	6106		
Modskin	44595					
Control B+	44564					



## MISC HARDWARE

CB1	<input type="checkbox"/>	2 MILS	<input type="checkbox"/>
EF1	<input type="checkbox"/>	REF2	<input type="checkbox"/>

PCB1 = 44461 PC BOARD

2 MILS = CONFORMAL COATING

2 MILS = CONFORMAL COATING  
DIE 1 - DIE 1004 SCHUETZ TO DAGE

REF2 = TEST FIXTURE / PROCEDURE

Thermo

THE UNIVERSITY OF CHICAGO PRESS

INTERLOCK CONTROL BOARD

Document Number	10041
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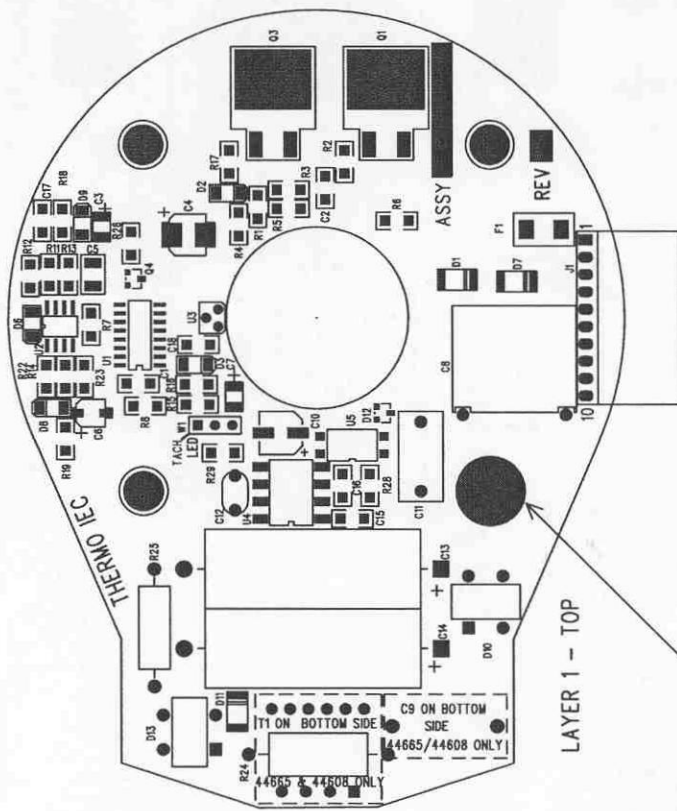
C	10944
Date:	Fri Aug 06 2010

WILLIAM F. FLEMMING, JR.

REVISIONS			
REV	ECO OR CHANGE DESC.	BY	APPV'D DATE
0	6106	CJS	9-30-02

NOTES: UNLESS OTHERWISE SPECIFIED:

1. WORKMANSHIP TO BE EQUAL TO AND COMPLIANT WITH THE REQUIREMENTS OF IPC-A-610.
2. THIS ASSEMBLY CONTAINS ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES; STATIC-FREE HANDLING IS REQUIRED.
3. DESIGNATIONS ARE FOR REFERENCE ONLY AND MAY NOT APPEAR AS SEEN ON ACTUAL ASSEMBLY.
4. DIMENSIONS SHOWN SPECIFY MAXIMUM ENVELOPE LIMITS FOR THE FINISHED ASSEMBLY.
5. ORIENTATION OF POLARIZED CAPACITORS IS DENOTED BY A PLUS (+) SIGN. POLARITY IS IDENTIFIED ON THE PART.
6. SQUARE PADS INDICATE PIN 1 OF MULTILEAD DEVICE
7. VENDOR IDENTIFICATION & SERIAL NUMBER TO BE MARKED ON BOARD
8. MARK ASSEMBLY AND REVISION NUMBER ON BOARD
9. FOR 44566 ASSEMBLY:
  - A JUMPER WIRE IS TO BE PLACED BETWEEN PINS 2 & 3 OF W1
10. INSTALL FUSE F2 IN F1 LOCATION.
11. HEIGHT SPECIFICATION FOR U3 IS  $0.27" \pm 0.01$ , FROM COMPONENT SIDE OF BOARD TO TOP OF U3.
12. APPLY 2 MILS OF CONFORMAL COATING TO BOTH SIDES OF THE ASSEMBLY. MASK OFF J1, U3 AND THE MOUNTING HOLE INDICATED, PRIOR TO APPLICATION.



<b>Thermo</b> ELECTRON CORPORATION		DATE	AWD	5/31/03
		CHECKED		
UNLESS OTHERWISE SPECIFIED REMOVE ALL BURRS & BREAK SHARP EDGES .005 MAX. DIMENSIONS ARE IN INCHES TOLERANCE ON		DATE		
		DATE		
DECIMALS .XX +/- .015 .XXX +/- .005 FRACTIONS +/- 1/32 ANGLES +/- 1°		DATE		
		DATE		
PROJECT APPROVAL PROJECT APPROVAL		DATE		
		DATE		
SURFACE ROUGHNESS ✓		DATE		
		DATE		
DO NOT SCALE PRINT		DATE		
SCALE 2/1		DATE		
SHEET 1 OF 1		DATE		

CL2  
INTERLOCKING CONTROL BOARD

SIZE C  
CODE IDENT NO. 44566  
REV 0

**Parts List, DWG 44566**

Part Number	Description	Part Reference	Quantity
WIR0005-00	JUMPER,INSULATED	W1	1
RES0145-01	RES,CC,820K,1/4W,5% GENERIC	R19	1
RES0117-01	RES,CF,51.1K,1/4W,1%	R15	1
RES0107-01	RES,CC,470K,1/4W,5%, GENERIC	R17	1
RES0090-01	RES,CC,33K,1/4W,5%, GENERIC	R5	1
RES0084-01	RES,CC,3.3K,1/4W,5%, GENERIC	R4 R6	2
RES0034-00	RES,CF,137K,1/4W,1%, GENERIC	R16	1
RES0022-01	RES, MF, 10K, 1/8W, 5%, SM Dale CRCW1206103JRT1	R26	1
RES0015-01	RES,CC,100K,1/4W,5%, GENERIC	R3 R13 R14 R22 R23	5
RES0015-00	RES,CF,100K,1/4W,1%, GENERIC	R18	1
RES0012-01	RES,CC,100,1/4W,5%, GENERIC	R1, R2	2
RES0007-01	RES,CC,1.5M,1/4W,5%, GENERIC	R7	1
REF50458	TEST FIXTURE/PROCEDURE	REF2	1
REF10944	SCHEMATIC,PC BD	REF1	1
RCT0044-00	RECTIFIER, SMT 400V 1A FAST RECOVERY, Vishay DL 4936-13	D7	1
RCT0043-00	RECTIFIER, SMT 200V 1A, Vishay DL 4003-13	D1	1
ICD0063-00	IC,CMOS,DUAL,MULTIVIBRATOR,SMT NS PKG, TI CD14538B NS	U1	1
ICA0018-01	IC,OP-AMP,DUAL,SINGLE SUPPLY, National LM358AMX	U2	1
ICA0017-00	IC,HALL EFFECT,LATCHING, ALLEGRO A3189LUA	U3	1
HDW0003-00	CONFORMAL COATING, CHEMTRONICS Konform SR 2000	MISC1	1
FUS0039-00	FUSE,1A,125V,TIME-LAG, 396 SERIES, WICKMANN WK4448BK-ND	F2	1
FUS0037-00	FUSE HOLDER, TE5 SMT, WICKMANN WK0010CT-ND	F1	1
FET0022-00	MOSFET, N-CHNL,14A,250V Vgs = 20V, IR IRF644S	Q1 Q3	2
FET0000-01	N-CHANNEL, 60V, 800mA, Motorola 2N7002	Q4	1
Motorola 2N7002	DIODE,SIGNAL, Motorola DL4148	4 D2 D3 D8 D9	4
CON0000-00	HEADER,PC MNT,10 PIN,RGHT ANG, Molex 22-05-3101	J1	1
CAP0219-00	CAP AL, EL, 4.7uF, 50V, +/-20%, 105C, SM, Panasonic EEVFC1H4R7R	C4	1
CAP0211-00	CAP TYPE-Y1,1000pF,250VAC, Panasonic ECK-DNA102ME	C11	1
CAP0113-00	CAP TANT,1UF,16V, Kemet T491A105K016	C3 C7	2
CAP0106-00	CAP, X7R, 0.1uF, 50V, 10%, SM, Kemet C1206C104K5RAC	C1 C17 C18	3
CAP0059-00	CAP MONO CER,0.1UF,50V, AVX 12065C104KAT	C2	1
CAP0027-00	CAP ELECT,1UF,50V, Calchip 6ACE1ROM50V4X5.5	C6	1
44461	ARTWORK,PC BD	PCB1	1

## Warranty

Thermo warrants that the Products will operate substantially in conformance with Thermo's Specifications applicable to such Products, when subjected to normal, proper and intended usage by properly trained personnel, for a period of twenty-four (24) months from the date of installation, not to exceed thirty (30) months from date of shipment from Thermo (the "Warranty Period"). Thermo agrees during the applicable Warranty Period, provided it is promptly notified in writing upon the discovery of any defect and further provided that all costs of returning the defective Products to Thermo are pre-paid by Purchaser, to repair or replace, at Thermo's option, non-conforming Products so as to cause the same to operate in substantial conformance with said Specifications. Such repair shall include parts only during the final twelve (12) months of the Warranty Period. Replacement parts may be new or refurbished, at the election of Thermo. All replaced parts shall become the property of Thermo. Lamps, fuses, bulbs and other expendable items are expressly excluded from the warranty. Thermo's sole liability with respect to equipment, materials, parts or software furnished to Thermo by third party suppliers shall be limited to the assignment by Thermo to Purchaser of any such third party supplier's warranty, to the extent the same is assignable. In no event shall Thermo have any obligation to make repairs, replacements or corrections required, in whole or in part, as the result of (i) normal wear and tear, (ii) accident, disaster or event of force majeure, (iii) misuse, fault or negligence of or by Purchaser, (iv) use of the Products in a manner for which they were not designed, (v) causes external to the Products such as, but not limited to, power failure or electrical power surges, (vi) improper storage of the Products or (vii) use of the Products in combination with equipment or software not supplied by Thermo. If Thermo determines that Products for which Purchaser has requested warranty services are not covered by the warranty hereunder, Purchaser shall pay or reimburse Thermo for all costs of investigating and responding to such request at Thermo's then prevailing time and materials rates. If Thermo provides repair services or replacement parts that are not covered by the warranty, Purchaser shall pay Thermo therefore at Thermo's then prevailing time and materials rates. ANY INSTALLATION, MAINTENANCE, REPAIR, SERVICE, RELOCATION OR ALTERATION TO OR OF, OR OTHER TAMPERING WITH, THE PRODUCTS PERFORMED BY ANY PERSON OR ENTITY OTHER THAN THERMO WITHOUT THERMO'S PRIOR WRITTEN APPROVAL, OR ANY USE OF REPLACEMENT PARTS NOT SUPPLIED BY THERMO, SHALL IMMEDIATELY VOID AND CANCEL ALL WARRANTIES WITH RESPECT TO THE AFFECTED PRODUCTS.

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**DECLARATION OF CONFORMITY**  
According to ISO/IEC guide 22 and EN45014

Manufacturer's Name **Thermo Electron Corporation**

And Address: **450 Fortune Blvd  
Milford, MA 01757  
USA**

Declares under our sole responsibility that the product:

**Model Centra CL2; Type 427 Centrifuge**

to which this declaration relates, is in conformity with the following standards and normative documents

**EMC**

EN 55011, Class A, Group 1, Limits and Measurement Methods for Radio Disturbance of Industrial, Scientific, and Medical Equipment  
EN61326: 2002, Electrical equipment for measurement, control and laboratory use - EMC requirements  
EN61000-4-2, Electrostatic Discharge  
EN61000-4-3, Radiated Electromagnetic Fields  
EN61000-4-4, Electrical Fast Transient / Burst  
EN61000-4-5, Surge Immunity Requirements  
EN61000-4-6, Conducted Disturbances Induced by Radio-Frequency Fields  
EN61000-4-11, Voltage Dips, Short Interruptions and Voltage Variations.  
EN61000-3-2: Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase), Class A  
EN61000-3-3; +A1 Electromagnetic compatibility (EMC) Part 3-3: Limits - Limitations of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current  $\leq 16$  A per phase

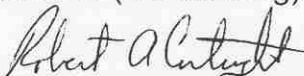
**SAFETY**

EN61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use- with Amendment s 1 & 2  
EN 61010-2-20, Part 2, Particular Requirements for Laboratory Centrifuges, +A1: 1996

Following the provisions of Directives 73/23/EEC (Low Voltage) and 89/336/EEC (EMC) as amended by 93/68/EEC (CE Marking).

Dated January 12, 2004

by



Robert A. Cutright  
VP Engineering  
Thermo Electron Corporation

# Thermo Electron Corporation

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